

40. [New] A machine-vision system for inspecting a plurality of tray-held devices, each device having a first side and a second side, the machine-vision system comprising:

a first inspection station for inspecting a first side of the devices held in a tray that has a long-dimension side and a short-dimension side;

a second inspection station for inspecting a second side of the devices; and

a tray-transfer device that operates to invert the devices and move the devices from the first inspection station to the second inspection station in a direction substantially perpendicular to the long dimension side of the tray so as to reduce the distance of movement needed.

41. [New] The system of claim 40 wherein tray-transfer device operates to invert the devices and place the devices back into the same tray so that the first side of the devices can be inspected at the first inspection station in the tray and the second side of the device can be inspected at the second inspection station in the same tray.

41. [New] The system of claim 40 wherein tray-transfer device operates to invert the devices and place the inverted devices into a different tray than that used at the first inspection station.

Applicant respectfully requests a favorable examination of the merits of this patent application. The Examiner is invited to telephone Applicant's attorney (612-373-6949) to facilitate prosecution of this application. Please charge any additional fees deemed necessary to Deposit Account 19-0743.

Respectfully submitted,

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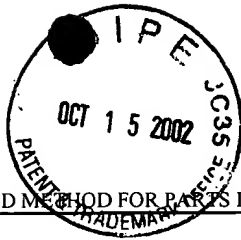
CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Commissioner of Patents, Washington, D.C. 20231, on this 4 day of October, 2002.

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Clean copy of pending claims

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3. [Previously Amended Three times] A machine-vision system for inspecting a device, the device having a first side and a second side, the machine-vision system comprising:
- a first inspection station for inspecting a first side of a device;
 - a second inspection station for inspecting a second side of a device; and
 - a tray-transfer device that operates to move the device in a tray having a long-dimension side and a short-dimension side from the first inspection station to the second inspection station in a direction perpendicular to the long-dimension side, said tray-transfer device further including an inverting mechanism that operates to invert the device so that the first side of the device can be inspected at the first inspection station and the second side of the device can be inspected at the second inspection station, wherein the inverting mechanism further comprises a mechanism for flipping the devices carried in a tray, the mechanism further comprising:
 - a first jaw having a surface for receiving a first tray;
 - a second jaw having a surface for receiving a second tray;
 - a mover for moving the first jaw, the first tray having a plurality of devices, the second tray, and the second jaw into engagement with each other, said first tray associated with the first jaw and the second tray associated with the second jaw; and
 - a rotator for rotating the first and second jaws.
4. The machine-vision system of claim 3 wherein the mover moves the first jaw in a direction substantially perpendicular to the surface for receiving a tray associated with the first jaw.
5. The machine-vision system of claim 3 wherein the mover moves the first jaw and the second jaw in a direction substantially perpendicular to the surface for receiving a tray associated with the first jaw.

6. [Previously Amended Once] The machine-vision system of claim 3 wherein the inverting mechanism moves the plurality of devices to the second tray such that the second sides of the plurality of devices are presented for inspection.

7. [Previously Amended Once] The machine-vision system of claim 3 wherein the rotator of the inverting mechanism moves the plurality of devices to the second tray such that the second sides of the plurality of devices are presented for inspection.

8. The machine-vision system of claim 6 wherein the mover of the inverting mechanism is adapted to place the plurality of devices in the second tray at the second inspection station.


9. [Previously Amended Once] The machine-vision system of claim 8 wherein the tray transfer device includes means for moving the second inspection station with respect to the inverting mechanism.

10. The machine-vision system of claim 8 further comprising a picker for picking devices which fail inspection from the second tray.

12. [Previously Amended Twice] A machine-vision system for inspecting a plurality of devices positioned within a plurality of device-carrying trays, the machine-vision system comprising:

- a first tray adapted to carry a plurality of devices;
- a second tray adapted to carry a plurality of devices;
- a flip station for flipping the plurality of devices carried in a first tray from a first inspection position in the first tray to a second inspection position in the second tray wherein the flip station further comprises:

- a first jaw having a surface for receiving a first tray;
- a second jaw having a surface for receiving a tray;
- a mover for moving the first jaw, a first tray having a plurality of devices,

 a second tray, and the second jaw into engagement with each other, said first tray associated with the first jaw and the second tray associated with the second jaw; and

a rotator for rotating the first and second jaws; and
a mover that moves the first tray to the flip station in a direction substantially perpendicular to a longer side of the first tray to reduce a distance of travel of the first tray.

13. [Previously Amended Once] The machine-vision system of claim 12 further comprising:
a first tray-transfer device for holding at least the first tray, said first tray-transfer device moving the first tray from the first inspection station to the flip station; and
a second tray-transfer device for holding at least the second tray, said second tray-transfer device moving the second tray from the flip station to the second inspection station.

14. [Previously Amended Once] The machine-vision system of claim 12 wherein the flip station further comprises a mechanism for flipping the devices carried in a tray, the mechanism further comprising means for limiting the motion of the rotator.

15. The machine-vision system of claim 12 wherein the mover moves the first jaw in a direction substantially perpendicular to the surface for receiving a tray associated with the first jaw.

16. The machine-vision system of claim 12 wherein the mover moves the first jaw and the second jaw in a direction substantially perpendicular to the surface for receiving a tray associated with the first jaw.

17. [Previously Amended Once] A flipping mechanism for transferring a plurality of devices from a position in a first tray to a position in a second tray, the flipping mechanism comprising:
a first jaw having a surface adapted to receive the first tray;
a conveyor that moves the first tray to the first jaw in a direction substantially parallel to a

shortest side dimension of the first tray;

a second jaw having a surface adapted to receive the second tray;

a mover for moving the first jaw, the first tray, the second tray, and the second jaw into engagement with each other, said first tray associated with the first jaw and the second tray associated with the second jaw; and

a rotator for rotating the first and second jaws.

18. [Previously Amended Once] The flipping mechanism of claim 17 wherein the mover can be controlled to remove the first tray from a first inspection surface.

19. [Previously Amended Once] The flipping mechanism of claim 17 wherein the mover can be controlled to place the second tray at a second inspection surface.

20. [Previously Amended Once] A method for acquiring physical information associated with a plurality of devices placed in a tray, the method comprising the steps of:

inspecting a first side of a device within a first tray;

moving the first tray in a direction substantially perpendicular to a longer side of the first tray to reduce a distance of travel of the first tray to a flip station;

moving a second tray to a position near the first tray;

flipping the first tray and second tray to move the device from the first tray to the second tray and place the device in the second tray so that a second side of the device is presented in the second tray; and

inspecting a second side of the device within the second tray.

21. [Previously Amended Once] The method of claim 20, further including the step of moving the second tray to a second inspection surface in a direction substantially perpendicular to a longer side of the second tray to reduce a distance of travel of the second tray from the flip station.

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22. [Previously Amended Twice] A machine-vision system for inspecting a plurality of devices and for inverting the plurality of devices from being positioned in a first tray, the machine-vision system comprising:

a first jaw having a surface for receiving the first tray;
a second jaw having a surface;
a mover for moving the first jaw, the first tray having a plurality of devices, and the second jaw into engagement with each other, said first tray associated with the first jaw; and
a rotator that rotates the first and second jaws to a position such that the devices are inverted and supported by the second jaw and are then are placed back into the first tray in the inverted position.

23. The machine-vision system of claim 22 further comprising;

a first conveyer for moving the first tray having a plurality of devices therein to the first jaw; and

a second conveyer for moving the first tray having a plurality of devices therein from the first jaw.

24. The machine-vision system of claim 22 wherein the first jaw is capable of holding, in any position, a tray devoid of devices.

25. The machine-vision system of claim 22 further comprising;

a slider for transferring the inverted devices from the second jaw into the first tray.

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27. The machine-vision system of claim 3 wherein the rotator rotates the first and second jaws simultaneously.

28. The machine-vision system of claim 12 wherein the rotator rotates the first and second jaws simultaneously.

29. The flipping mechanism of claim 17 wherein the rotator rotates the first and second jaws simultaneously.
30. The method of claim 20, wherein moving the second tray to the position near the first tray further includes moving the second tray to engage the first tray, and wherein flipping the first tray and second tray is done simultaneously after engagement.
31. The machine-vision system of claim 22 wherein the rotator rotates the first and second jaws simultaneously.
32. [Amended once] A machine-vision system for inspecting a plurality of devices, each device having a first side and a second side, the machine-vision system comprising:
- a first inspection station for inspecting a first side of the devices held in a tray;
 - a second inspection station for inspecting a second side of the devices held in the tray;
- and
- a tray-transfer device that operates to move the devices from the first inspection station to the second inspection station, said tray-transfer device further including an inverting mechanism that operates to invert the devices and place the devices back into the same tray so that the first side of the devices can be inspected at the first inspection station in the tray and the second side of the device can be inspected at the second inspection station in the tray.
33. The system of claim 32 wherein the tray has a long dimension side and a short dimension side, and is moved from the first inspection position to the inverting mechanism in a direction substantially perpendicular to the long dimension side so as to reduce the amount of movement needed.
34. The system of claim 33 wherein the inverting mechanism is positioned between the first inspection position and the second inspection position, and wherein the tray has a long dimension side and a short dimension side, and is moved from the first inspection position to the inverting

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mechanism and to the second inspection position in a direction substantially perpendicular to the long dimension side so as to reduce the amount of movement needed.

35. A machine-vision system for inspecting a plurality of devices positioned within a plurality of device-carrying trays, the machine-vision system comprising:

- a first tray adapted to carry a plurality of devices;
- a flip station for flipping the plurality of devices carried in the first tray from a first inspection position in the first tray to a second inspection position in the first tray.

36. The machine-vision system of claim 34, wherein the flip station further comprises a mechanism for flipping the devices while the devices are carried in a tray.

37. A machine-vision system for inspecting a device, the device having a first side and a second side, the machine-vision system comprising:

- a first inspection station for inspecting a first side of a plurality of devices;
- a second inspection station for inspecting a second side of a plurality of devices;
- a tray-transfer device that operates to move the devices in a tray from the first inspection station to the second inspection station, said tray-transfer device further including an inverting mechanism that operates to invert the devices so that the first side of the devices are inspected at the first inspection station and the second side of the devices are inspected at the second inspection station, wherein the inverting mechanism further comprises a mechanism for flipping the devices carried in a tray, the mechanism further comprising:

- a first jaw having a surface for receiving a first tray;
 - a second jaw having a surface for receiving a second tray;
 - a mover that moves the second jaw such that the second tray comes into engagement with the first tray, said first tray associated with the first jaw and the second tray associated with the second jaw; and
 - a rotator for rotating the first and second jaws; and
- a pick-and-place mechanism that removes rejected devices that fail an inspection at the

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first or second inspection station from the second tray and replaces the removed devices with good devices that passed inspection, in order to achieve an all-good tray of devices.

38. The system of claim 37, wherein the first inspection station is a three-dimensional scanning station that provides height measurements for a plurality of points on a first side each device.

39. The system of claim 38, further comprising a third inspection station that provides two-dimensional measurements for a plurality of points on the first side each device.

40. [New] A machine-vision system for inspecting a plurality of tray-held devices, each device having a first side and a second side, the machine-vision system comprising:
a first inspection station for inspecting a first side of the devices held in a tray that has a long-dimension side and a short-dimension side;
a second inspection station for inspecting a second side of the devices; and
a tray-transfer device that operates to invert the devices and move the devices from the first inspection station to the second inspection station in a direction substantially perpendicular to the long dimension side of the tray so as to reduce the distance of movement needed.

41. [New] The system of claim 40 wherein tray-transfer device operates to invert the devices and place the devices back into the same tray so that the first side of the devices can be inspected at the first inspection station in the tray and the second side of the device can be inspected at the second inspection station in the same tray.

42. [New] The system of claim 40 wherein tray-transfer device operates to invert the devices and place the inverted devices into a different tray than that used at the first inspection station.